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Study of Spin-Polarized Transport Properties for Spin-FET Design Optimization

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Abstract

A Monte Carlo method developed previously for spin dynamics is applied to study spin-polarized transport properties of two-dimensional electron gas in semiconductor spin-FET structure. The specific symmetry of spin-orbit terms (Rashba and Dresselhaus) leads to strong anisotropy of spin dynamics in the low field regime. Coherent spin evolution and spin dephasing are investigated for different orientations of the device channel related to the crystallographic axes. Efforts have been made to suppress spin dephasing while conserving coherent oscillation of spin polarization required for spin-FET design. Results derived from this study provide useful information to assist in optimization of the spin-FET performance.

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Keywords

Anisotropy, Monte Carlo, Spin relaxation, Spin-FET, Spintronics